Datasheet

NetApp EF560 All-Flash Array

Response in microseconds for your most demanding enterprise applications

Key Benefits

Extreme Performance
Over 825,000 IOPS and microsecond latency help you complete business operations more quickly and improve the customer experience.

Maximum Efficiency
Overprovisioning is eliminated and costs are dramatically reduced by cutting space requirements, power usage, and cooling by up to 95%.

High Availability
A fully redundant, six-9s enterprise-grade building-block system with automated failover and advanced monitoring maximizes uptime.

Modular Scalability
Support for up to 384TB of raw capacity in modular 2U building blocks provides more data access with low-latency performance.

Enterprise-Proven Platform
Leveraging experience from nearly 1 million systems, the flash-optimized NetApp® EF560 is designed to work in the most demanding environments.

The Challenge
Increasingly, organizations are looking for ways to drive greater speed and responsiveness from the applications that control their key business operations. Because the performance of these applications is tightly linked to time to market, revenue, and customer satisfaction, it is critical that they operate at maximum efficiency.

To achieve extreme performance, organizations have had to deploy hundreds more hard disks that are only partially filled. This overprovisioning of hard disks wastes disk capacity and data center space, and it drives up power consumption. To eliminate overprovisioning and to maximize return on investment from high-performance applications, companies now look to all-flash systems. However, as buyers consider these new systems for their tier 1 applications, they are often challenged to find an offering that is also enterprise proven and highly reliable.

The Solution
The NetApp EF560 all-flash array is an all-SSD storage system for applications that demand extremely high levels of performance, reliability, and availability. Requiring just 2U of rack space, the EF560 all-flash array combines extreme IOPS, microsecond response times, and up to 12GBps of bandwidth with leading, enterprise-proven availability features, including:

- Redundant components with automated failover
- Intuitive storage management with comprehensive tuning functions
- Advanced monitoring and diagnostics with proactive repair
- NetApp Snapshot® copies and remote replication for subsecond backup and long-distance recovery

Combined, these capabilities enable the EF560 all-flash array to improve the speed of business as well as the overall efficiency and reliability of IT operations. This win for both the business and IT translates to a better overall experience for you and your customers.

■ NetApp®

Extreme Performance

The EF560 all-flash array continues NetApp's long heritage of delivering powerful solutions to meet business needs. Designed specifically for high-speed transactional applications that demand high IOPS and consistent low latency, the EF560 all-flash array delivers over 825,000 sustained IOPS and response times in microseconds. Bandwidth-oriented workloads also benefit from the capability of the EF560 to provide up to 12GBps of throughput.

The all-flash design is built in a 2U enclosure and delivers the performance of over a thousand 15,000-RPM drives while requiring just 5% of the rack space, power, and cooling. With up to 95% reduction in space and power consumption, the EF560 all-flash array helps to significantly improve the overall efficiency of IT operations while continuing to meet performance requirements from business operations.

High Availability and Enterprise Reliability

The EF560 all-flash array was engineered from the start to support applications that are the heart of a corporation's business. Built with reliability in mind, the EF560 all-flash array leverages extensive expertise learned from 1 million implemented systems to provide enterprise reliability and fault tolerance in both the architecture and the software design.

Designed with no single point of failure, the EF560 all-flash array has fully redundant I/O paths with automated failover and extensive diagnostic capabilities that alert on and actively help resolve failures. It also offers advanced data protection features such as Snapshot copies and replication. All management tasks are performed while the storage remains online with complete read/write data access. Storage administrators can make configuration changes and conduct maintenance without disrupting application I/O.

One of the most critical aspects of an enterprise solution is the ability to detect and resolve issues. In this area, the EF560 all-flash array provides significant depth of capabilities, including:

- Extensive capturing and monitoring of diagnostic data provide comprehensive fault isolation and simplify analysis of unanticipated events.
- Drive health monitoring proactively tracks the wear life of each SSD and issues an alert if defined thresholds are reached.
- The integrated Recovery Guru diagnoses problems and provides the applicable procedure to use for recovery.
- "Lost" data can be re-created dynamically by using redundancy.
- A drive rebuild can continue even when encountering an unreadable sector (patented technology).

Advanced Data Protection

To protect against data loss and downtime events, both locally and over long distance, the EF560 all-flash array offers advanced data protection that is common to enterprise storage. These features include:

- **Snapshot copies.** Create and restore point-in-time copies of datasets in less than a second to protect against accidental data loss on the local array.
- **Volume copy.** Create a complete physical copy (clone) of a volume for applications that require a full point-in-time copy of production data.
- **Remote replication**. Provide long-distance disaster recovery to a remote site or colocation facility to enable your business operations to continue running no matter what happens.

One innovation in the EF560 all-flash array is the capability to replicate data to either an EF560 or a NetApp E-Series system. With this capability, you can create a high-speed, low-latency recovery system that runs at the same speed as your production operations. You can also choose to fail over to a consolidated E-Series system with more cost-effective disk storage. This flexibility in design allows you to choose the profile of performance and cost that your business needs.

Disk Encryption

NetApp SANtricity® full disk encryption* combines local key management with drive-level encryption for comprehensive security for data at rest with no impact to performance. Because all drives eventually leave the data center though redeployment, retirement, or service, it is reassuring to know that your sensitive data isn't leaving with them.

Simple, Optimized Management

The EF560 all-flash array runs on the enterprise-proven SANtricity software platform. Optimized for flash, SANtricity software allows storage administrators to maximize performance and use of their EF560 through extensive configuration flexibility, custom performance tuning, and complete control over data placement. Its graphically based performance tools provide key information about storage I/O from multiple viewpoints, allowing administrators to make informed decisions on configuration adjustments to further refine performance.

SANtricity Dynamic Disk Pools (DDP) technology allows storage administrators to simplify RAID management, improve data protection, and maintain predictable performance under all conditions. DDP technology evenly distributes data, protection information, and spare capacity across the entire EF560 pool of drives, simplifying setup and maximizing use. This next-generation technology minimizes the performance impact of a drive failure and can return the system to optimal condition up to eight times more quickly than with traditional RAID. With shorter rebuild times and patented technology to prioritize reconstruction, DDP capabilities significantly reduce exposure to multiple disk failures, offering a level of data protection that simply can't be achieved with traditional RAID.

With SANtricity software, all management tasks can be performed while the storage remains online with complete read/write data access. Storage administrators can make configuration changes, conduct maintenance, or expand the storage capacity without disrupting I/O to attached hosts. SANtricity software online capabilities include:

- Dynamic volume expansion allows administrators to increase the capacity of an existing volume.
- Dynamic segment size migration enables administrators to change the segment size of a given volume.
- Dynamic RAID-level migration changes the RAID level of a RAID group on the existing drives, without requiring the relocation of data. Supported RAID levels are 0, 1, 3, 5, 6, and 10.
- Nondisruptive controller firmware upgrades (no interruption to data access) are supported.

"The EF-Series could handle 10 times the number of concurrent users in 95% less processing time, even while playing large video files."

Bill Kernan, CIO
Western Oregon University

Application Integration

The NetApp SANtricity Plug-Ins for Microsoft, Oracle, Splunk, and VMware provide a consolidated view of the NetApp EF-Series systems, enabling users to monitor and manage their NetApp EF-Series storage from the application. Having such an integrated tool reduces the total cost of ownership by eliminating the need to manually compile critical information from several different tools. Thus it streamlines the correlation of availability and performance problems across the entire set of IT components.

Professional and Support Services
Achieve high availability and performance

Professional and support services, delivered by NetApp and its services certified partners, can help you architect a data management solution that optimizes performance and availability for business-critical enterprise applications. We have the skills and the expertise you need, whether you are struggling to meet SLAs or need help identifying workloads that are best suited for flash. We can also help you get your all-flash storage into production quickly and with minimal disruption. We offer:

- **Plan services.** Gain insight and guidance by identifying challenges, opportunities, risks, and requirements for improving IT service delivery today and in the future.
- **Build services.** Speed deployments and integration to lower your risk, deployment time, and cost to deliver business results faster.
- **Run services.** Deliver end-to-end oversight to achieve continuous operations and operational excellence.

Services from NetApp and its certified partners combine a history of enterprise storage know-how with proven expertise in defining data management strategies and in deploying integrated storage solutions for a data fabric. Our services can help you rapidly respond to changing business needs across multiple applications, systems, and locations worldwide.

For more information
- NetApp EF560: http://www.netapp.com/us/products/storage-systems/ef-series/index.aspx
- NetApp Professional Services: www.netapp.com/us/services/professional/

About NetApp

Leading organizations worldwide count on NetApp for software, systems and services to manage and store their data. Customers value our teamwork, expertise and passion for helping them succeed now and into the future.
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Technical Specifications

All the data in this table applies to dual-controller configurations.

Attribute	NetApp EF560 All-Flash Array
Burst I/O rate	900,000 IOPS
Sustained I/O rate	825,000 IOPS
Latency	<300μs up to 500,000 IOPS; <800μs up to 825,000 IOPS
Sustained throughput	Up to 12GBps
Maximum drives	120 (EF560 with 4 expansion shelves)
Maximum raw capacity	384TB
Drive types supported	2.5" SSD: 400GB, 800GB, 1.6TB, 3.2TB non-FDE 2.5" SSD: 800GB FDE, 2.5" SSD: 1.6TB FIPS
Form factor	Base system: 2U/24* Expansion shelf: 2U/24*
System memory	24GB, 96GB**
Host I/O ports	8 x 16Gb FC, 8 x 12Gb SAS, 8 x 10Gb iSCSI, or 4 x 56Gb InfiniBand

Technical Specifications (cont'd)

High-availability features	Dual active controller with automated I/O path failover Dynamic Disk Pools technology and traditional RAID levels 0, 1, 3, 5, 6, and 10 Redundant, hot-swappable storage controllers, disk drives, power supplies, and fans Automatic DDP or RAID rebuild following a drive failure Mirrored data cache with battery backup and destage to flash SANtricity proactive drive health monitoring to identify problems before they create issues Six-9s availability (with appropriate configuration and service plans)
Host operating systems	Microsoft Windows Server, Red Hat Enterprise Linux, Novell SUSE Linux Enterprise Server, VMware ESX, Oracle Solaris, IBM AIX, HP HP-UX, Apple Mac OS
Included software features	SANtricity mirroring SANtricity volume copy SANtricity Snapshot image SANtricity thin provisioning Dynamic Disk Pools technology
Optional software features	SANtricity disk encryption
System capabilities	Data Assurance (T10-PI IEEE standard) Dynamic volume expansion Dynamic capacity expansion Dynamic RAID-level migration Dynamic segment size migration System event monitor Proactive drive heath monitoring NetApp AutoSupport® automatic support system Online SANtricity OS upgrades and drive firmware upgrades VMware vSphere Storage APIs – Array Integration (VAAI) Microsoft Windows Offloaded Data Transfer (ODX)
Application plug-ins***	SANtricity Plug-In for Oracle Enterprise Manager SANtricity Management Pack for Microsoft System Center Operations Manager (SCOM) SANtricity Plug-In for Microsoft SQL Server Management Studio (SSMS) SANtricity Plug-In for VMware vCenter SANtricity VASA provider SANtricity Storage Replication Adapter for VMware vCenter Site Recovery Manager SANtricity Performance App for Splunk Enterprise SANtricity Plug-In for Nagios
Open management	SANtricity OpenStack Cinder SANtricity Web Services Proxy (REST and SYMbol Web) SANtricity PowerShell Toolkit
System maximums	Hosts/partitions: 512 Volumes: 2,048 Snapshot copies: 2,048 Mirrors: 128

Dimensions and Weight	EF560 Base System	EF560 Expansion Shelf
Height	3.47" (8.81cm)	3.47" (8.81cm)
Width	19" (48.26cm)	19" (48.26cm)
Depth	19.6" (49.78cm)	19.6" (49.78cm)
Weight	58.59lb (26.58kg)	52.91lb (24.00kg)
Power and Cooling****		
kVA	Typical: 0.457 Maximum: 0.627	Typical: 0.158 Maximum: 0.327
Watts	Typical: 452.9 Maximum: 620.67	Typical: 156.27 Maximum: 324.04
BTU	Typical: 1,545.3 Maximum: 2,117.81	Typical: 533.22 Maximum: 1,105.67

* The base system and expansion shelves can be configured with a minimum of 6 SSDs.
** Available with storage arrays that have FC or iSCSI host I/O ports only.
*** Available for download at no charge from mysupport.netapp.com.
**** The typical was measured by using twenty-four 400GB SSDs. The maximum was measured by using twenty-four 3.2TB SSDs.